

Amendments to the Claims:

This listing of claims replaces all prior versions, and listings, of claims in the application:

Listing of Claims:

- 1 Claim 1 (currently amended): A method for generating image data for
2 rendering on a hardcopy document, comprising:
3 identifying a primary set of symbol data; the primary set of symbol data
4 providing a first channel of human readable information to be rendered on the
5 hardcopy document; and
6 computing a secondary set of encoding data from the primary set of symbol
7 data; the secondary set of encoding data providing an assist channel of machine
8 readable information to be rendered on the hardcopy document; wherein said
9 computing further comprises:
10 partitioning the primary set of symbol data into a plurality of groups;
11 the plurality of groups classifying symbol data according to how likely the
12 symbol data ~~will occur in the hardcopy document~~ are to be confused during
13 processing of a scanned representation of the primary set of symbol data,
14 and
15 developing the secondary set of encoding data by associating the
16 symbol data with ones of the plurality of groups.

- 1 Claim 2 (original): The method according to claim 1, further comprising
2 assigning an identifier to each of the plurality of groups that partition the primary
3 set of symbol data.

Claim 3 (canceled).

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1 Claim 4 (original): The method according to claim 1, further comprising
2 compressing the secondary set of encoding data.

Claim 5 (canceled).

1 Claim 6 (currently amended): The method according to claim [[5]] 4, wherein
2 said compressing is performed with arithmetic encoding.

1 Claim 7 (currently amended): The method according to claim 4, further
2 comprising scrambling the compressed secondary set of encoding data, wherein
3 said scrambling ~~further~~ comprises:
4 computing a hash h_i for each symbol in the primary set of symbol data with
5 a state change function $H(h_{i-1}, c_i)$, where h_{i-1} is a previous occurrence of the state
6 change function H for the symbol c_{i-1} ; and
7 developing the secondary set of encoding data cd_i for each corresponding
8 symbol c_i by scrambling each separation code d_i with a guard value g_i derived
9 from the computed hash h_i .

1 Claim 8 (original): The method according to claim 1, further comprising
2 encoding the machine readable information with data glyphs.

1 Claim 9 (original): The method according to claim 1, wherein the primary set of
2 symbol data and the secondary set of encoding data are rendered by a printer on
3 the hardcopy document.

1 Claim 10 (original): The method according to claim 1, wherein said partitioning
2 further comprises:
3 defining a graph with a node for each symbol in the primary set of symbol
4 data;
5 assigning a value to each of the nodes that quantifies how likely the symbol
6 data will occur in the hardcopy document;
7 interconnecting the nodes of the graph with arcs; and
8 assigning a value to each of the arcs that quantifies how likely symbol data
9 in the primary set of symbol data are likely to be confused during processing of
10 the scanned representation of the symbol data.

1 Claim 11 (currently amended): The method according to claim 10, wherein said
2 partitioning further comprises iteratively ~~compute~~ computing a partition of the
3 graph that maximizes a ratio of the values of each of the arcs and the values of
4 each of the nodes until achieving a desired benefit or entropy.

1 Claim 12 (original): The method according to claim 1, further comprising:
2 recording a scanned representation of the hardcopy document that
3 includes the primary set of symbol data and a secondary set of encoding data;
4 and
5 decoding the scanned representation of the hardcopy document by
6 identifying a shortest path of a product graph of the scanned representation of the
7 primary set of symbol data and the secondary set of encoding data.

1 Claim 13 (original): The method according to claim 12, wherein said decoding is
2 performed using a shortest path computation.

1 Claim 14 (original): The method according to claim 13, wherein the shortest
2 path computation comprises a two-pass dynamic programming computation.

Claim 15 (canceled).

1 Claim 16 (currently amended): The method according to claim ~~[[15]]~~ 12, wherein
2 the product graph is defined by:
3 identifying templates from a template library that matches the primary set of
4 symbol data;
5 defining nodes that correspond to both position in the primary set of symbol
6 data and the secondary set of encoding data; and
7 defining arcs that identify template matches of the primary set of symbol
8 data that are consistent with the secondary set of encoding data.

1 Claim 17 (currently amended): An apparatus for generating image data for
2 rendering on a hardcopy document, comprising:
3 means for identifying a primary set of symbol data; the primary set of
4 symbol data providing a first channel of human readable information to be
5 rendered on the hardcopy document; and
6 means for computing a secondary set of encoding data from the primary
7 set of symbol data; the secondary set of encoding data providing an assist
8 channel of machine readable information to be rendered on the hardcopy
9 document; wherein said computing means further comprises:
10 means for partitioning the primary set of symbol data into a plurality
11 of groups; the plurality of groups classifying symbol data according to how
12 likely the symbol data ~~will occur in the hardcopy document~~ are to be

13 confused during processing of a scanned representation of the primary set
14 of symbol data, and

15 means for developing the secondary set of encoding data by
16 associating the symbol data with ones of the plurality of groups.

Claim 18 (canceled).

1 Claim 19 (original): The apparatus according to claim 17, wherein said
2 partitioning further comprises:

3 means for defining a graph with a node for each symbol in the primary set
4 of symbol data;

5 means for assigning a value to each of the nodes that quantifies how likely
6 the symbol data will occur in the hardcopy document;

7 means for interconnecting the nodes of the graph with arcs; and

8 means for assigning a value to each of the arcs that quantifies how likely
9 symbol data in the primary set of symbol data are likely to be confused during
10 processing of the scanned representation of the symbol data.

1 Claim 20 (currently amended): The apparatus according to claim 17, further
2 comprising:

3 means for recording a scanned representation of the hardcopy document
4 that includes the primary set of symbol data and a secondary set of encoding
5 data; and

6 means for decoding the scanned representation of the hardcopy document
7 by identifying a shortest path of a product graph of the scanned representation of
8 the primary set of symbol data and the secondary set of encoding data.